Kansas State Agricultural College.

EXPERIMENT STATION.—Bulletin 182.

ED. H. WEBSTER, *Director.*

FARM BULLETIN.

Department of Veterinary Science.

F. S. SCHOENLEBER, *Veterinarian in Charge.*

TABLE B. GENERAL SUMMARY.

Method.	Condition of herd.	Total number of herds.	Total number vaccinated.	Number died.	Number recovered.	Per cent recovered.
Serum alone..—	Diseased	235	16,543	5,031	11,506	[illegible]
	Non-infected.	145	9,350	24	9,326	99.73
	Both	380	25,893	5,055	20,832	80.5
Simultaneous..—	Diseased	8	657	52	605	92
	Non-infected.	33	2,565	82	2,483	96.8
	Both	41	3,222	134	3,088	95.5
Double.......—	Diseased	14	909	388	521	57.3
	Non-infected.	18	2,870	24	2,876	99.17
	Both	32	3,779	412	3,367	89
All methods..—	Diseased	257	18,109	5,471	12,632	69.8
	Non-infected.	196	14,785	130	14,655	99.1
	Both	453	32,894	5,601	27,287	83

Vaccination Against Hog Cholera.

BY

F. S. SCHOENLEBER.

MANHATTAN, KAN.
MAY, 1912.
4-2602

DEPARTMENT OF VETERINARY SCIENCE.

DR. F. S. SCHOENLEBER........	Veterinarian in Charge and State Veterinarian.
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DR. J. H. BURT.................	Assistant Professor and Physiologist.
DR. R. R. DYKSTRA............	Assistant Professor, in Charge of Surgery and Clinic.
DR. BURTON R. ROGERS........	Instructor and Anatomist.
DR. J. B. GINGERY.............	Assistant in Hog Cholera Serum Production.
L. B. BARBER..................	Assistant in Hog Cholera Serum Production.
THOS. P. HASLAM, M. S........	Assistant in Corn Mold Investigations.

Work of the Department of Veterinary Science.

SCHOOL OF VETERINARY MEDICINE:

Giving a full four-year course of instruction and graduating students with the degree of Doctor of Veterinary Medicine.

Investigating corn mold and troubles caused by diseased corn and stalks.

Production of anti-hog-cholera serum.

Production of blackleg vaccine.

State veterinary work of investigating contagious diseases.

Veterinary work connected with the State Live-stock Registry Board.

Supervision of testing cattle for tuberculosis.

Special lines of investigation are taken up from time to time, as necessity demands.

Bulletins are issued on these subjects, which, with the bulletins of other departments of the Station, may be obtained free of charge by residents of the state, by addressing the Director, Experiment Station, Manhattan, Kan.

Vaccination Against Hog Cholera.

PRESENT STATUS OF THE WORK.

The use of anti-hog-cholera serum as a preventive of hog cholera has passed the experimental stage. Its place in preventive medicine is now thoroughly established. While there is no doubt that a great many improvements will yet be made in the methods of production and application, its efficiency can no longer be questioned. The reports, as given in the following tables of vaccinations, are about the average reports in all cases. It is a noticeable fact that in a community or in a county where a large number of hogs are vaccinated the results are coming in more satisfactorily with each report, the later results being much better than those preceding. This is due, no doubt, to the fact that the hog raiser and the veterinarian are becoming more familiar with the use of the serum and are becoming more expert in diagnosing the disease. By referring to table A it will be noted that out of a total of 235 diseased herds 100 per cent of the hogs vaccinated were saved in forty herds, and that nearly 70 per cent of all hogs vaccinated in all diseased herds were saved, showing that the serum has some virtue as a curative agent, although in this it should not be relied upon. The losses from the serum-alone treatment in healthy herds and a great majority of the losses in the simultaneously vaccinated herds were not caused from cholera but from other causes. A thorough study of the different methods as recorded in the tables warrants the following

Conclusions: Vaccination should be done while the animals are still healthy, but if cholera is present, a large per cent is saved through the use of the serum; and the earlier it is used in an outbreak the greater the per cent saved.

RESULTS OF VACCINATING.

Of the 292,400 hogs vaccinated with the serum produced by the Veterinary Department of the Kansas State Agricultural College during the year 1911, reports have been received covering something over 32,000 head. Of these 25,893 were given

the serum-alone treatment; 3222 were given the simultaneous method; and 3779 were vaccinated with the double method, that is, were given the serum alone and about ten days later were given the simultaneous method.

Of the total number reported, 18,109 were in infected herds and 14,785 were in non-infected herds.

The losses in non-infected herds, where serum alone was used, amounted to about one per cent. In the main these losses were confined to a very few herds. Where subsequent investigation was made, the greater number of these losses were directly traceable to other causes.

In infected herds where the serum was used there was a saving of 69.8 per cent. In many of these herds the disease had gained such a foothold that practically all animals in the herd were sick at the time of vaccination. In other instances, where as many as fifty per cent of the herd had died with the cholera, vaccination stopped the progress of the disease at once with very few losses following, and in many herds no further losses occurred.

TABLE No. I. INFECTED HERDS—SERUM ALONE.

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
1	200	100	100	50
2	800	300	500	65
3	14	2	12	85.7
4	23	1	22	95.5
5	20	18	2	10
6	6	5	1	16.6
7	20	16	4	20
8	25	20	5	20
9	45	3	42	93.3
10	24	20	4	16.3
11	10	0	10	100
12	43	3	40	90.7
13	20	0	20	100
14	13	3	10	77
15	39	8	31	80
16	58	47	11	20
17	30	2	28	93.3
18	80	48	32	40
19	29	9	20	69
20	620	76	544	87.6
21	31	4	27	87
22	112	5	107	95.5
23	32	24	8	25
24	87	9	78	89.6
25	20	17	3	15
26	105	25	80	76.1
27	26	0	26	100
28	10	0	10	100
29	15	3	12	80

TABLE NO. I—*continued.*

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
30	20	14	6	30
31	75	39	36	48
32	9	3	6	67
33	30	8	22	73
34	85	4	81	95.3
35	20	3	17	85
36	50	20	30	60
37	11	1	10	90
38	140	7	133	95
39	17	8	9	53
40	89	1	88	98
41	30	6	24	80
42	70	27	43	61.4
43	30	19	11	36.6
44	40	14	26	65
45	22	3	19	87
46	54	34	20	33.3
47	114	20	94	82.5
48	30	21	9	30
49	53	0	53	100
50	190	67	123	65
51	500	350	150	30
52	120	0	120	100
53	10	0	10	100
54	67	12	55	82
55	8	0	8	100
56	75	1	74	98.6
57	275	0	275	100
58	40	30	10	25
59	52	34	18	34.6
60	50	31	19	38
61	45	43	2	4.7
62	53	53	0	0
63	16	1	15	94
64	150	30	120	80
65	100	51	49	49
66	200	100	100	50
67	300	4	296	98.9
68	23	18	5	21.7
69	70	20	50	71.3
70	90	50	40	44.4
71	85	8	77	90.5
72	70	12	58	83
73	15	2	13	86.6
74	50	35	15	30
75	20	10	10	50
76	250	0	250	100
77	85	0	85	100
78	13	0	13	100
79	70	25	45	64.3
80	10	4	6	60
81	70	10	60	88.8
82	15	10	5	33.3
83	9	1	8	88.8
84	16	0	16	100
85	20	1	19	95
86	250	12	238	91.2
87	60	15	45	75
88	70	0	70	100

TABLE NO. I—*continued.*

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
89	400	20	380	95
90	45	0	45	100
91	42	40	2	4.8
92	19	0	19	100
93	84	62	12	14.3
94	85	25	60	70.6
95	10	1	9	90
96	19	8	11	58
97	20	0	20	100
98	8	2	6	75
99	649	376	273	42.4
100	204	103	101	49.5
101	10	1	9	90
102	5	3	2	40
103	19	10	9	47.4
104	55	50	5	91
105	121	28	93	77
106	11	8	4	36.3
107	35	1	34	97
108	120	55	65	54
109	45	10	35	77.7
110	59	41	18	30.5
111	73	1	72	98.6
112	5	4	1	20
113	30	26	4	13.3
114	175	6	169	96.6
115	94	4	90	94.7
116	40	10	30	75
117	30	7	23	76.6
118	110	27	83	75.4
119	56	21	35	62.5
120	20	0	20	100
121	50	8	42	84
122	75	12	63	84
123	35	5	30	85.7
124	85	12	73	83.5
125	70	5	65	92.8
126	105	3	102	97
127	17	1	16	94
128	25	0	25	100
129	30	0	30	100
130	30	4	26	86.6
131	56	0	56	100
132	50	0	50	100
133	4	1	3	75
134	24	6	18	37.5
135	5	2	3	60
136	16	12	4	25
137	6	2	4	66.6
138	36	0	36	100
139	55	2	53	96.3
140	36	0	36	100
141	45	43	2	44.4
142	29	4	25	86
143	236	138	191	81
144	22	1	21	90.9
145	50	5	45	90
146	5	0	5	100
147	61	30	31	50.8

TABLE No. I—*continued.*

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
148	50	25	25	50
149	25	8	17	68
150	10	3	7	70
151	50	3	47	94
152	70	20	50	71.4
153	40	27	13	32.5
154	40	30	10	25
155	30	15	15	50
156	150	20	130	86.6
157	10	0	10	100
158	62	59	3	48.4
159	20	6	14	70
160	40	1	39	95.5
161	4	2	2	50
162	9	1	8	88.8
163	11	1	10	91
164	8	0	8	100
165	336	80	256	76.4
166	60	30	30	50
167	90	60	30	33.3
168	20	8	12	60
169	90	60	30	33.3
170	188	6	182	96.7
171	13	2	11	84.6
172	35	1	34	97
173	63	0	63	100
174	25	12	13	52
175	15	15	0	0
176	15	0	15	100
177	167	15	152	90.4
178	35	35	0	0
179	113	30	83	73.5
180	69	15	54	78
181	6	1	5	83.3
182	97	6	91	93.8
183	45	9	36	80
184	318	275	43	13.5
185	22	0	22	100
186	51	12	39	13.3
187	113	15	98	86.7
188	7	1	6	85.5
189	35	14	21	60
190	105	6	99	94.3
191	14	0	14	100
192	88	14	74	84
193	75	2	73	97.3
194	83	20	63	76
195	13	9	4	31
196	90	80	10	11.1
197	12	1	11	91.6
198	85	25	60	70.6
199	75	14	61	81.3
200	260	30	230	88.4
201	13	7	6	46.1
202	43	21	22	51
203	45	23	22	49
204	16	12	4	25
205	23	1	22	95.2
206	100	70	30	30

TABLE No. I—*concluded.*

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
207	58	2	56	96.5
208	36	15	21	55.5
209	18	0	18	100
210	10	0	10	100
211	77	1	76	98.7
212	248	200	48	15.7
213	38	4	34	89.5
214	113	18	95	84
215	22	0	22	100
216	72	13	59	82
217	46	6	40	87
218	114	0	114	100
219	77	15	62	80.5
220	27	0	27	100
221	12	0	12	100
222	22	11	11	50
223	41	1	40	97.6
224	7	1	6	85.6
225	38	10	28	73.7
226	73	35	38	52.5
227	90	40	50	55.5
228	18	9	9	50
229	29	26	3	10.3
230	110	0	110	100
231	13	0	13	100
232	100	11	89	89
233	63	16	47	74.6
234	11	0	11	100
235	49	39	10	20.4
Totals........	16,543	5,031	11,506	69.55

TABLE No. II. SERUM ALONE—NON-INFECTED HERDS.

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
1	25	0	25	100
2	12	0	12	100
3	28	0	28	100
4	16	0	16	100
5	78	2	76	97.4
6	15	0	15	100
7	11	0	11	100
8	140	0	140	100
9	56	0	56	100
10	7	0	7	100
11	52	0	52	100
12	56	0	56	100
13	32	0	32	100
14	10	0	10	100
15	24	0	24	100
16	35	0	35	100
17	25	0	25	100
18	110	0	110	100
19	40	0	40	100

TABLE NO. II—*continued.*

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
20	72	0	72	100
21	40	0	40	100
22	45	0	45	100
23	17	0	17	100
24	134	4	130	97
25	85	0	85	100
26	14	0	14	100
27	38	0	38	100
28	450	0	450	100
29	160	0	160	100
30	240	0	240	100
31	80	0	80	100
32	70	0	70	100
33	16	0	16	100
34	80	0	80	100
35	40	0	40	100
36	56	0	56	100
37	242	0	242	100
38	45	0	45	100
39	3	0	3	100
40	160	0	160	100
41	7	0	7	100
42	45	0	45	100
43	94	1	93	98.9
44	38	0	38	100
45	16	0	16	100
46	60	0	60	100
47	27	0	27	100
48	100	0	100	100
49	230	0	230	100
50	100	2	98	98
51	98	0	98	100
52	225	0	225	100
53	25	0	25	100
54	9	0	9	100
55	22	0	22	100
56	20	0	20	100
57	23	0	23	100
58	52	0	52	100
59	35	0	35	100
60	43	0	43	100
61	36	0	36	100
62	150	2	148	98.7
63	20	0	20	100
64	100	0	100	100
65	23	0	23	100
66	81	0	81	100
67	75	0	75	100
68	111	0	111	100
69	18	0	18	100
70	33	0	33	100
71	105	0	105	100
72	43	0	43	100
73	63	0	63	100
74	63	0	63	100
75	43	0	43	100
76	36	0	36	100
77	11	0	11	100
78	97	0	97	100

TABLE NO. II—*continued.*

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
79	9	0	9	100
80	28	0	28	100
81	6	0	6	100
82	20	0	20	100
83	32	0	32	100
84	90	0	90	100
85	80	0	80	100
86	65	0	65	100
87	41	1	40	97.6
88	50	0	50	100
89	10	0	10	100
90	12	0	12	100
91	65	0	65	100
92	9	0	9	100
93	65	0	65	100
94	90	0	90	100
95	70	0	70	100
96	60	0	60	100
97	65	0	65	100
98	10	0	10	100
99	80	0	80	100
100	45	0	45	100
101	108	0	108	100
102	120	0	120	100
103	50	0	50	100
104	63	0	63	100
105	55	0	55	100
106	70	2	68	97.1
107	100	1	99	99
108	56	0	56	100
109	88	0	88	100
110	5	0	5	100
111	80	0	80	100
112	40	0	40	100
113	47	0	47	100
114	63	0	63	100
115	12	1	11	91.9
116	20	0	20	100
117	36	0	36	100
118	125	0	125	100
119	100	0	100	100
120	9	0	9	100
121	45	0	45	100
122	28	0	28	100
123	8	0	8	100
124	210	0	210	100
125	70	0	70	100
126	56	2	54	96.4
127	78	0	78	100
128	80	2	78	97.5
129	100	3	97	97
130	50	0	50	100
131	64	0	64	100
132	25	1	24	96
133	34	0	34	100
134	45	0	45	100
135	21	0	21	100
136	460	0	460	100
137	110	0	110	100

TABLE No. II—*concluded.*

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
138	130	0	130	100
139	25	0	25	100
140	14	0	14	100
141	57	0	57	100
142	36	0	36	100
143	46	0	46	100
144	28	0	28	100
145	45	0	45	100
Totals.........	9,350	24	9,326	99.73

TABLE No. III. RESULTS OF SIMULTANEOUS METHOD IN *INFECTED* HERDS.

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
1	16	1	15	93.8
2	12	0	12	100
3	149	11	138	95.3
4	40	21	19	47.5
5	23	0	23	100
6	23	8	15	65.2
7	34	0	34	100
8	360	11	349	97
Totals..........	657	52	605	92

TABLE No. IV. REPORTS OF SIMULTANEOUS METHOD IN *NON-INFECTED* HERDS.

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
1	12	0	12	100
2	175	2	173	98.8
3	100	12	88	88
4	155	1	154	99.3
5	100	0	100	100
6	447	26	421	96.5
7	158	14	144	91.1
8	58	4	54	93.1
9	37	1	36	97.3
10	6	0	6	100
11	12	0	12	100
12	19	2	17	89.5
13	39	0	39	100
14	13	0	13	100
15	39	0	39	100
16	7	0	7	100
17	4	0	4	100
18	38	1	37	97.4
19	51	0	51	100
20	2	0	2	100

TABLE No. IV—*concluded.*

Herd No.	*Number vaccinated.*	*Number died.*	*Number recovered.*	*Per cent recovered.*
21	41	0	41	100
22	97	0	97	100
23	15	0	15	100
24	4	0	4	100
25	146	0	146	100
26	277	13	264	95.3
27	118	0	118	100
28	48	0	48	100
29	29	6	23	79.3
30	43	0	43	100
31	27	0	27	100
32	145	0	145	100
33	103	0	103	100
Totals..........	2,565	82	2,483	96.8

TABLE No. V. RESULTS OF DOUBLE METHOD IN *INFECTED* HERDS.

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
1	71	4	67	94.4
2	21	5	16	76.2
3	31	0	31	100
4	15	0	15	100
5	26	21	5	19.2
6	5	3	2	40
7	82	6	76	92.7
8	60	0	60	100
9	152	111	41	27
10	55	22	33	60
11	26	3	23	88.8
12	256	209	47	18.4
13	60	0	60	100
14	49	4	45	91.8
Totals..........	909	388	521	57.3

TABLE No. VI. RESULTS OF DOUBLE METHOD IN *NON-INFECTED* HERDS.

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
1	115	0	115	100
2	123	0	123	100
3	41	0	41	100
	59	5	54	91.5
5	126	0	126	100
6	9	0	9	100
7	35	0	35	100
8	24	0	24	100
9	84	0	84	100

TABLE No. VI—*concluded.*

Herd No.	Number vaccinated.	Number died.	Number recovered.	Per cent recovered.
10	50	0	50	100
11	1,565	16	1,549	98.6
12	125	0	125	100
13	133	0	133	100
14	260	0	260	100
15	45	0	45	100
16	31	0	31	100
17	5	3	2	60
18	40	0	40	100
Totals.........	2,870	24	2,846	99.17

TABLE A. SUMMARY OF HOGS SAVED AFTER VACCINATION IN DISEASED HERDS.

In 40	diseased herds	100 %	recovered after vaccination.
In 43	"	90 to 100 %	" "
In 40	"	80 to 90 %	" "
In 23	"	70 to 80 %	" "
In 15	"	60 to 70 %	" "
In 18	"	50 to 60 %	" "
In 12	"	40 to 50 %	" "
In 17	"	30 to 40 %	" "
In 11	"	20 to 30 %	" "
In 11	"	10 to 20 %	" "
In only 5	"	less than 10 %	" "
In 235	diseased herds	69.55 %	recovered after vaccination.

TABLE B. GENERAL SUMMARY.

Method.	Condition of herd.	Total number of herds.	Total number vaccinated.	Number died.	Number recovered.	Per cent recovered.
Serum alone..	—Diseased	235	16,543	5,031	11,506	69.55
	Non-infected.	145	9,350	24	9,326	99.73
	Both	380	25,893	5,055	20,832	80.5
Simultaneous..	—Diseased	8	657	52	605	92
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	Both	41	3,222	134	3,088	95.5
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	Non-infected.	18	2,870	24	2,876	99.17
	Both	32	3,779	412	3,367	89
All methods..	—Diseased	257	18,109	5,471	12,632	69.8
	Non-infected.	196	14,785	130	14,655	99.1
	Both	453	32,894	5,601	27,287	82

THE STATE SERUM PLANT.

The system of producing the serum, and the capacity of the plant, have been brought to a point where in a month's time the output can be increased to over two million cubic centimeters per month or over one hundred thousand doses. There were in cold storage June 1, 1912, over one hundred thousand doses against less than half that amount at the same time a year ago with the capacity of the plant only about one-quarter its present size. It would seem that no matter how urgent the future demand the college will be able to take care of it.

THREE METHODS OF VACCINATING.

THE SERUM-ALONE METHOD. The first method is to use the serum alone. In this method there is simply injected into the tissues of the hog a dose of the anti-hog-cholera serum, which makes the hog immune against the cholera for a time varying from a few weeks to several months. This is the method used when, for instance, a very fat show herd is vaccinated. It is absolutely safe. It is also used in herds where the cholera exists or where some of the animals have been exposed to the disease. After the disease has been in a herd for several days it frequently occurs that vaccinating does little good. Thus the earlier the vaccination the more certain the results. A day's time may mean either the loss or saving of a large part of the herd. Where vaccinating is done in diseased herds, the amount of serum is increased from one-half to double the regular dose.

THE SIMULTANEOUS METHOD. The second method is one in which there is some danger, but the result, if the animal survives, should render the animal immune for the rest of its life. It is the simultaneous method. In this there is injected at the same time with the serum, but in a different place, a small amount of virulent blood, or blood taken from a hog very sick with the cholera. This method really gives the hog a slight form of the disease, and as a consequence the animal does not take the cholera the second time—it has been artificially immunized. This is a very satisfactory method when used in a healthy herd, that is, before the animals become infected. Great care is necessary in this method that too much of the virulent blood is not used; if the dose of this is too large, the

form of the disease may become so severe as to make the hog quite sick with the cholera and it may even cause death.

THE COMBINATION METHOD. The third method is the one which was originated and thoroughly tested by the writer and is a combination of the first and second methods. Vaccinate first with the serum alone, and ten days later vaccinate with the simultaneous method. This is by far the most satisfactory and safe method in an exposed herd; or if there is cholera in the herd or in the vicinity; or if the hogs are fat or otherwise very valuable.

WHERE TO VACCINATE. The ordinary method is to vaccinate on the inside and in the fleshy portion of the ham. While this method brings results as far as vaccination is concerned, the method is undesirable because this location is easily infected, causing abscesses or tumors, which are very objectionable to the packers, frequently ruining a considerable portion of the most valuable part of the hog. Some operators vaccinate immediately under the skin under the jowl or flank. Sows heavy in pig are sometimes vaccinated just back of the ear. These two last methods have the disadvantage of its taking longer to absorb the serum, but it is less liable to cause serious infection.

VETERINARIANS SHOULD DO THE VACCINATING. On account of using the dangerous virulent blood and the ease with which the disease is spread, it has seemed advisable to have the vaccinating done by graduate veterinarians who have received proper instructions in the methods and are qualified to handle the dangerous materials. The danger is thus reduced to a minimum, although, in spite of the greatest care, there are at times losses from vaccinating.

THE STATE LAW. Section 20 of chapter 312 of the State Live Stock law reads as follows: "That it is hereby declared unlawful for any person to knowingly inject any virulent hog-cholera blood into any hog in the state of Kansas, except under the direction of the live-stock sanitary commissioner; provided, that this section shall not apply to the authorities of the State Agricultural College, at Manhattan, Kan. Any person violating the provisions of this section shall upon conviction thereof be adjudged guilty of a misdemeanor and fined in a sum of not less than $100 and not more than $500 for each and every offense."

IMMEDIATE EFFECTS OF VACCINATION. When the serum is potent and the work is properly done, the hog seldom loses a feed. The serum, however, causes a reaction, and slight fever frequently follows. For several days the temperature may vary several degrees, sometimes going to 106 degrees and even higher. From six to ten days after vaccinating with the serum-alone method the temperature should be back to normal again—about 103 degrees. In the simultaneous method several weeks should be allowed for the vaccination to take full effect.

LOSSES FROM VACCINATION. The susceptibility of hogs to the disease varies greatly in different herds and even in the same herd. At times there are a few hogs in a herd which are so susceptible to the cholera germ that no amount of serum will prevent them from dying with the disease. Again, there are losses in vaccinating hogs, not alone from the fact that they may be extremely susceptible (hyper-susceptible), but from the infection through the wound made by the needle. This loss, all told, when all the conditions are right and the work properly done, should not be more than from one to two per cent of the animals vaccinated in healthy herds. Ordinarily there are no losses whatever.

Occasionally reports reach us that vaccinating causes the loss of some apparently well animals and the serum is blamed. Some of these reports have reached us in time to investigate the trouble. The causes of death usually vary, but the following are among the most common: animals sick with pneumonia or some disease other than cholera; too small a dose of serum; infection getting into the wound made by the needle in vaccinating; exposure to the weather after vaccinating; turning out into filthy yards. Thus the college can not be held responsible for accidents, as the greatest care is taken in producing, testing and handling the serum. The serum alone can not possibly cause cholera, and if a sufficient dose of serum is given healthy hogs are not injured by the serum-simultaneous method. Hogs vaccinated by the simultaneous method do not communicate the disease to others nor infect the pens or yards unless they themselves become sick.

CARE OF HOGS BEFORE VACCINATING. Before vaccinating cut down the rations two or three days, feeding very little corn. Keep the animals clean and in dry and comfortable quarters,

free from dust and, if possible, in disinfected pens. If the weather is favorable, a dipping is advisable a few days before vaccinating.

TREATMENT AFTER VACCINATING. From the fact that there is always more or less fever caused by vaccinating and more or less danger of the animal becoming infected through the wound made by the needle, the following after-treatment would suggest itself: spare diet for three or four days; very little corn, but plenty of water; thoroughly clean and comfortable pens; an abundance of clean bedding with absolutely no chance to get into mud or draft of any kind. The more mud and dust, the more danger. Hogs should not be dipped or operated upon for several weeks after vaccinating.

VACCINATING INSTRUMENTS. Two hypodermic syringes are used in vaccinating, one for the serum, which holds either twenty or thirty cubic centimeters, and one for virulent blood, which holds five cubic centimeters. The two sizes are used to prevent any mistakes. A thermometer is used to take the temperatures, as we make it a rule not to use virulent blood but serum only if the temperature is high. Before injecting the serum, use a small scrub brush and thoroughly clean the field of operation. Strong antiseptics are also used here both before and after injecting, especially where the virulent blood is injected. If this is not done, the small drop on the end of the needle may infect the whole premises. This is very important. The wound may also become infected and cause abscesses and even blood poison if not thoroughly disinfected.

THE SERUM. This "serum" is the defibrinated blood drawn from a hog made hyper-immune by injecting a quart or more of defibrinated cholera blood into the ear veins of an immune hog. A very small amount of a weak solution of carbolic acid is added to the serum to help preserve it. The serum is very easily spoiled after it is exposed to the atmosphere, heat or cold. It is also very easily contaminated, and will then cause abscesses, or, if the proper organisms are present, may even cause the death of the hog. A constant temperature of from 45 to 50 degrees will keep the serum in a sealed bottle for many months. A very small amount of dirt or dust in the serum or in the wound made by the needle in vaccinating may cause abscesses or blood poisoning.

CONTROLLING THE DISEASE. As soon as an outbreak is noticed all the hogs should be confined in as small an enclosure as possible, and at once vaccinated with the serum-alone method. Ten days later they should be given the simultaneous method. They should be kept away from creeks and rivers and the whole place quarantined so far as the neighbors are concerned. At the same time all the healthy hogs on surrounding farms for some distance from the infected ones should also be vaccinated with the double method. This will usually check an outbreak which might otherwise get beyond control.

WHEN NOT TO VACCINATE. If the hogs are unthrifty or have some other disease; if they are badly infested with worms or are mangy; if their pens and yards are not in a sanitary condition; if they can not be given proper shelter, feed, and care; in fact, if it can not be done under proper conditions, it is best not to vaccinate at all, as the results will frequently be far from satisfactory.

VACCINATING THE PIGS. If there is no danger from the cholera, vaccination should be deferred until the pigs weigh about forty to sixty pounds unless they are from simultaneously immunized sows, in which case they should be vaccinated at the age of from four to five weeks.

EFFECT OF VACCINATION ON THE OFFSPRING. When the serum-alone method is used, vaccination does not seem to have any noticeable effect upon the offspring. When either the serum simultaneous or the double method is used, the offspring from sows so vaccinated seem to possess a greater or less immunity which, after about four weeks, they gradually outgrow. A pregnant sow can be safely vaccinated at almost any period with the serum-alone method if she is carefully handled, but there is more or less danger in using the simultaneous method upon sows well along in pregnancy.

STOCKING UP AFTER AN OUTBREAK. The first thing to do after an outbreak is to disinfect the premises, houses and lots as thoroughly as possible. If the lots and pastures can be changed, it is all the better. If possible the new stock should be vaccinated with the simultaneous method. This department is in position to direct feeders to reliable firms who can furnish immune stock hogs.

FORMS OF THE DISEASE. Hog cholera is very contagious, but affects swine only. It appears usually in one of two forms, either acute or chronic. It is caused by the germ in the blood tissues and discharges of the hogs, which to the present time has been grown nowhere else. In favorable locations it seems to live for many months. The acute form usually kills in from six to sixteen days. The chronic form is more mild and runs a slower course, the hog continuing sick for a month or more before either death or recovery takes place.

CONDITIONS FAVORING THE DISEASE. Overcrowding in the sleeping quarters, especially where different sized animals are kept in the same pen, favors the spread of the disease. The smaller pigs become too hot and then very easily catch cold. Damp, filthy, dark pens where little fresh air or sunshine can reach; sleeping in a draft under buildings or windows; too much green corn; too close breeding or inbreeding; the accumulation of vermin on the animal itself or in the pens; too exclusive a corn diet—these are additional conditions favoring the spread of cholera. The hog being frequently a scavenger, following cattle in all kinds of mud, filth and dust, is likely to take in germs or irritating dust, and the lungs consequently become infected with tuberculosis or other debilitating disease germs. In fact anything that has a tendency to weaken the system of the animal renders him a more fit subject for hog cholera.

AGE. While the disease has no respect for the age, size or breed of hogs when it once starts in a drove, it is usual for an outbreak to begin with the younger pigs and later to attack the more mature animals. But this is not always the case.

SYMPTOMS. Cholera usually starts with a diarrhœa. The pigs quit feeding, many have coughs and are dumpish for several days, lose all energy, gradually become weaker and die. The older hogs usually act in the same way, except that they do not become so thin before they die. Sometimes a constipation precedes the diarrhœa for a longer or shorter period. The discharges are usually very offensive. There is frequently a discharge from the eyes which resembles pus, but may be sticky enough to gum the lids together.

In some outbreaks one or two hogs may not feel well for several days, and before the owner is aware of the fact, the whole herd may be infected and a greater or less number die

every day. Some may show symptoms of a severe illness, such as fever, weakness, loss of appetite, diarrhœa, redness of the skin of the abdomen or flanks and in patches around the snout or ears, while others may show but a few of these symptoms before death.

CONDITIONS OR DISEASES WHICH RESEMBLE CHOLERA. Some conditions or diseases which resemble cholera are: tuberculosis, although this disease is usually much slower in its progress; ordinary digestive troubles, due to improper feeding or insanitary surroundings; anthrax; pneumonia, caused by dust, cold or worms. Garbage which contains much soap, lye or salt will frequently cause death with symptoms resembling cholera; so also will moldy bread, cottonseed meal, new corn, or too sudden changes of feed. Many things which are unfit for human food are thrown into the swill barrel, to form toxins and ptomains. These may cause vomiting, bloody diarrhœa, griping, nervous trouble, weakness, staggering gait, dullness and death, all of which may in some stages resemble cholera.

SEASON OF THE YEAR. Hog cholera is mostly a warm weather disease but is also prevalent in the fall of the year and early winter. During cold weather the cases, as a rule, become more chronic; the hogs do not die so suddenly, and a greater per cent of them get well.

MANNER OF INFECTION. Since cholera is a contagious disease, it follows that the germ must be carried into a herd. It is distributed somewhat on the same plan as are those of typhoid fever, scarlet fever or diphtheria in the human race. The germs are present in the blood and tissues of the affected animals, and are thrown off through every avenue of the body, especially through the urine and feces. In this way they infect the whole yard in which hogs are kept, and also everything in the yard and pens. The smallest particles of dirt, dust or straw—so small that it can not be seen—can carry enough germs to infect several herds of hogs. It is thus apparent that a stranger should not be allowed near the pens of sick hogs; neither should the attendant be allowed to leave the vicinity of the pens without first thoroughly cleaning and disinfecting his shoes or putting on others not infected. Dogs, cats, rabbits, rats, chickens, crows, pigeons, and other birds—in fact every living thing—should so far as possible be kept away from the infected places.

PUBLIC STOCK YARDS. It seems that we must consider all public stock yards infected with cholera. Persons walking from these public yards to the depot platforms naturally infect these places. It is in this way that a crated breeding-hog, shipped by freight or express, becomes exposed to the disease and may infect the whole premises when released from the crate. It is therefore not safe to take a hog upon the public highway unless it is vaccinated, especially if there has been cholera anywhere in the vicinity. In the fall of the year, during severe dust storms the germs may be blown a considerable distance with infected straw, weeds, etc.

After shipping, a hog should be dipped as soon as removed from the crate and kept away from all others for several weeks, and then dipped again before being allowed to come in contact with the rest. If a hog shows signs of sickness, it should be removed immediately and kept by itself until well.

PERIOD OF INCUBATION. The time required for a hog to become sick with cholera after being exposed to the disease varies, usually from six to fourteen days, but sometimes runs much longer.

PREVENTION OF THE DISEASE. When we recall the conditions which favor the disease and the manner in which the infection takes place, it will be seen that the feeding and care of hogs have much to do with the prevention of the cholera. Hogs should be provided with clean, dry pens; regular and proper feeding; comfortable sleeping quarters; plenty of sunshine; proper ventilation, as a pig requires twice the breathing space for every hundred pounds weight that is needed by either a horse or a cow. The pens should be cleaned and disinfected regularly. The hogs themselves should be dipped every few weeks when the weather is suitable. Maintaining these conditions helps to keep up the vitality of the hogs, and in this way troubles of all kinds are warded off. To aid digestion and circulation and to prevent worms, many hog raisers feed at regular intervals some of the following mixture, especially where the animals are confined to a small lot, the dose being one tablespoonful to every hundred pounds of hog:

Wood charcoal	1	pound.
Sulphur	1	"
Sodium chloride	2	"
Sodium bicarbonate	2	"
Sodium hyposulphite	2	"
Sodium sulphate	1	"
Antimony sulphide (black antimony)	1	"

WORMS IN HOGS. Hogs affected with worms in the intestines run down in condition, become very thin and scurvy; the back is arched, the eyes dull. The hogs refuse to eat, walk stiffly, and appear lifeless. The worms may be very numerous and, in bad cases, completely fill the intestines. Many of the pigs die if not treated. To secure the best results, affected hogs should receive individual treatment. Twenty-four hours before administering treatment, very little feed should be given. Then give the following medicine, as a drench if necessary, to each 100-pound hog; larger or smaller hogs should receive a dose in proportion:

Oil of turpentine	4 drachms.
Raw linseed oil	6 ounces.

If necessary repeat the dose in four days. After the worms have been removed, give the tonic recommended above to put the pigs in condition.

DISINFECTION. All straw, cobs and litter should be removed and burned, and a strong solution of some good coal-tar dip or crude carbolic acid, about one part of the dip to twenty of water, used on all woodwork and floors of the pens. Slaked lime scattered over the ground and floors of the pens every few days will help keep them clean.

POST MORTEMS. Care should be taken to prevent blood poisoning of the operator in the post mortem of any animal. If a person has any sore on his hand, he should not touch a dead animal, or if he should receive a cut or scratch during the examination, the hand should be placed in pure kerosene at once, the sore well filled and the bandage saturated with it.

When a hog has died quickly, within a few days after taking the disease, the kidneys frequently show dark spots on the surface. These resemble the spots on a turkey egg. Parts of the lungs may be found solid and dark, resembling the liver, or they may show bright blood-spots on their surface. The spleen may be larger than normal. The lymphatic glands, especially those along the intestines, are usually enlarged and dark. The intestines may contain blood or bloody feces.

In chronic cases, in which the hog lingers for a longer period before death, some of the above conditions may show prominently while others may not show at all. In these cases ulcers are usually found on the inner lining of the large intestine, which may be as large as an inch in diameter, or there

may be many smaller ones. As a rule, these do not show in the more acute forms of the disease. It seldom happens that all these conditions are found in the same animal, but any two of them are usually enough to warrant the diagnosis of hog cholera. When the ulcers in the intestines and the "turkey-egg kidneys" are found, they are almost positive evidence that the hog died of cholera.

HOW TO ORDER THE SERUM. If the disease is in the herd or the herd has been exposed, application may be made to the State Live Stock Sanitary Commissioner at Topeka. He will take care of the cholera cases in the same way that he deals with other contagious diseases. If the Sanitary Commissioner thinks it necessary to vaccinate, he will have it done, but the owner must buy the serum.

If the hogs are healthy, application is made direct to the Veterinary Department of the Agricultural College at Manhattan. The name of the veterinarian who is to do the vaccinating should be given. The cost of the serum is one and one-half cents per cubic centimeter, or about thirty-five cents for a pig weighing from twenty to fifty pounds.

It should always be stated whether the herd is perfectly healthy or whether there are some sick hogs. Also the number and weights of the hogs to be vaccinated should be given. If there is no graduate veterinarian near, the Veterinary Department has a record of all such men, with their qualifications, and will gladly supply this information.

In the beginning of an outbreak of cholera vaccinating, if properly done, saves the greater part of the herd, but it does less good after a herd has been thoroughly infected. The serum will not cure the cholera, but is only a preventive. It is therefore necessary to act promptly.

HOW MUCH SERUM TO ORDER. Do not order more than you need, as it can not be returned to the college. By consulting the table of dosage the amount needed can be very accurately calculated. It is put up in bottles of 50 cc., 100 cc., 200 cc., 500 cc., and 2000 cc. Check should always be sent with the order at the rate of one and one-half cents per cubic centimeters. The virulent blood is sold at the same price.

SCALE OF DOSES OF VIRUS AND SERUM.

VIRUS.

.05	cc per pound weight for suckling pigs.
.5	cc for all weights between 10 and 40 lbs.
1	cc for all weights between 40 and 80 lbs.
1.5	cc for all weights between 80 and 120 lbs.
2	cc for all weights over 120 lbs.

SERUM.

1 cc per pound weight up to 10 lbs.
10 cc for all weights between 10 and 20 lbs.
20 cc for all weights between 20 and 50 lbs.
30 cc for all weights between 50 and 75 lbs.
40 cc for all weights between 75 and 100 lbs.
50 cc for all weights between 100 and 150 lbs.
60 cc for all weights between 150 and 200 lbs.
70 cc for all weights between 200 and 250 lbs.
80 cc for all weights between 250 and 300 lbs.
90 cc for all weights between 300 and 400 lbs.
100 cc for all weights over 400 lbs.

The above doses of serum may also be used in the serum-alone and double methods.

COST OF PRODUCTION. The cost of the serum varies slightly with the price of hogs, being very close to one and one-half cents per cubic centimeter. It is readily seen that the plant is supposed to be self-supporting, and the serum sales are considered cash transactions. Serum is sent by express only. Great care is taken in packing, but if breakage occurs, the college can not be held responsible.

HOG CHOLERA SPECIFICS, VACCINES, ETC. Before buying or using any of the specifics or vaccines that are on the market or are sold through traveling agents, it is always best to inquire of the Veterinary Department of the college in regard to the efficiency of such material. This department has tested a great many of such products and will gladly give all possible information of the results of such tests.

A FEW PRECAUTIONS AND HINTS.

The smallest bottle used for serum contains 50 cc. The smallest for virulent blood contains 10 cc.

Orders are shipped no later than the day following their receipt.

Cost of both serum and virus is 1½ cents per cubic centimeter. The check should accompany the order.

Keep the serum in a constant temperature as near to 50 degrees as possible.

Do not remove the cork until you are ready to use the contents of bottle.

Keep the serum out of the light as much as possible, and do not expose it to the direct rays of the sun.

After the bottle is opened, use the virus within thirty-six hours. After the serum bottle is opened, use the serum within ten days.

Do not let the virus or the serum freeze.

Burn all the remaining virus to prevent accidental spread.

All instruments should be sterilized before using.

The field of operation (place of injection) should be aseptic or thoroughly disinfected with a good antiseptic solution.

The animals should be kept in a clean, comfortable place for several days both before and after vaccinating, and they should be fed very little corn.

There is only one way of positively diagnosing hog cholera, and that is by a post mortem examination.

There are many troubles of swine that are called hog cholera, and yet they have very little resemblance to that disease.

There are hog raisers and feeders who keep hoping against hope that the deaths in their herds are due to other troubles, when in reality they are due to cholera.

If a hog misses a feed, watch him; if he misses the second feed, remove him from the herd and thoroughly disinfect where he has been.

A cough in a hog can usually be traced to one of three things: dust, worms, or cold; but there is no telling what it may result in.

Pneumonia kills many pigs before they get used to sleeping in damp pens, drafts, or snow banks.

If the hogs are dying and the cause can not be found, have an expert hold several post mortem examinations.

Whether the herd is sick or healthy, air-slacked lime scattered in the pens and houses will pay well for the trouble.

Thumps—a spasmodic action of the diaphram caused from overstimulation, too much dust, too much heat, too many worms, too much anything.

Frozen alfalfa may kill a hog as quickly as it does a cow or a horse. It is usually indigestible.

A hog can not sleep comfortably in a draft or wind; he catches cold very easily.

If a hog dies and there is another in the same herd acting as though the dead one was his most intimate friend, cut the dead one open and examine thoroughly. If there are any red spots upon either the lungs, kidneys or bowels, or if the spleen is enlarged, or if there are any ulcers in the intestines, or if the skin of the abdomen is colored red or purple, the hog probably died of cholera.

Cholera usually affects the younger pigs and hogs first.

There are two forms of hog cholera—the acute and the chronic. The acute form kills very rapidly; the hogs "die like flies." With the chronic form the animals linger along for several days or weeks before they either die or get well. In the acute form, in the post mortem look for red spots on the internal organs, or for red skin. In the chronic form look for ulcers in the intestines.

In proportion to his size, a hog needs twice the air space that a horse or a cow does. However, he can not stand one-half of the exposure to the wind and weather.

Every Kansas hog should have his ration of alfalfa every day of his life.

When ordering serum or virulent blood, remember that it can not be returned to the college, therefore do not order any more than you actually need.

Do not forget to send a check, draft or money order with the order, as the serum plant is supposed to be self-supporting. We do not like to send serum C. O. D.